REMARKS

Applicant has amended claims 1, 23, 45, 46, and 54-60. Claims 1, 23, 45, 46, and 54-60 have not been amended in view of any cited art or rejection or for any other reason of patentability. Rather, 1, 23, 45, 46, and 54 have been amended to correct typographical errors and claims 55-60 have been amended to correct a typographical error in each claim dependency. No new matter has been added.

Accordingly, claims 1-61 are pending for examination with claims 1, 23, 45, 46, and 54 being independent claims.

Rejections under 35 U.S.C. § 112¶2

Claims 1, 23, 45-46, and 54-55 stand rejected under 35 U.S.C. § 112¶2 as being indefinite for failing to point out and distinctly claim the subject matter the applicant regards as the invention. Claims 1, 23, 45-46, and 54-55 has been amended to correct typographical errors, therefore, the rejection to these claims under 35 U.S.C. § 112 is moot.

Rejections under 35 U.S.C. § 102(b)

Claims 1-18, 22-40, and 44-61 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Nicolas Bruno, "Automatic Management of Statistics on Query Expressions in Relational Databases", published April 25, 2002 (hereinafter Bruno). The Applicant respectfully traverses the rejection as follows.

In general, Bruno is directed to disclosing the concept of generating statistics using the attributes of the results of query expressions, also known as statistics on intermediate tables (SITs), to generate estimated cardinalities of similar query plans. It should be noted that Bruno does not introduce a framework to determine which SITs are

useful for generating estimated cardinalities. In contrast, Claims 1-61 are drawn to utilizing conditional selectivity as a framework to identify and exploit SITs which are useful for cardinality estimates.

The rejection to Claims 1, 23, and 45 asserts that "if the query is not separable, decomposing the query selectivity to form a product that comprises a conditional selectivity expression" is disclosed in Bruno at page 9, section 3.2.2, and fig 3.1. The rejection further asserts "Bruno specifically teaches various predicates for example equality join, conjunctive [see fig 3.1b], join predicates, further for a given query, the decomposing query into possible sub queries."

The Applicant respectfully disagrees with the rejection. The cited section of Bruno fails to disclose decomposing the query selectivity to form a product that comprises a conditional selectivity expression. Conditional selectivity is a concept that is neither disclosed nor contemplated in Bruno. Note that the concept of conditional selectivity is discussed in the specification of the application in the section titled "Conditional Selectivity" beginning on page 9 of the specification of the application. For example, lines 13-17 of the specification of the application recite:

> ...it is desirable to supplement the enumerated alternatives from materialized view matching with additional alternatives that leverage multiple SITs simultaneously. This is accomplished by using conditional selectivity as a formal framework to reason with selectivity values to identify and exploit SITs for cardinality estimation.

The query transformation disclosed at Fig 3.1 of Bruno does not demonstrate a decomposition of the query's selectivity to form a product that comprises a conditional selectivity expression. For example, lines 16-18 of page 11 of the specification of the application recite:

Atomic decomposition is based on the notion of conditional probability and unfolds a selectivity value as the product of two related selectivity values:

$$SelR(P,Q) = SelR(P|Q) \cdot SelR(Q)$$

In contrast, Fig. 3.1 of Bruno does not demonstrate an algorithm performing any type of decomposition. In contrast, Fig. 3.1 of Bruno demonstrates an algorithm that makes use of SITs to transform an initial query plan to produce a resulting query plan. As the cited section of Bruno does not disclose the above-noted equation, the cited section of Bruno may not perform a decomposition of the query selectivity in accordance with Claims 1, 23, and 45. And, as it has been established that the cited section of Bruno may not perform a decomposition of the query selectivity in accordance with Claims 1, 23, and 45, the cited section of Bruno is further not capable of forming a product comprising a conditional selectivity expression from a decomposition of the query selectivity.

The rejection further asserts that "recursively performing step b)-c) to determine a selectivity value for each query selectivity factor" (as amended) is disclosed at page 5, lines 10-14, section 2.2.2. of page 6, and Fig. 2.4 of Bruno. Page 5, lines 10-14 of Bruno recites:

> Even for data sets with two or more dimensions, building the *V-optimal(v.f)* histogram is NP-Hard [26]. Therefore, practical static multidimensional histogram techniques use heuristics to partition the data space into buckets. A multidimensional version of the *EquiDepth* histogram [24] recursively partitions the data domain, *one dimension at a time*, into buckets enclosing the same number of tuples.

Section 2.2.2. of Bruno is titled "Join Queries" and recites a three step method, first aligning the histogram buckets discussed above such that the histogram bucket

boundaries agree and then analyzing each pair of aligned buckets such that an estimation of join sizes may be performed for each bucket, finally aggregating the join sizes to determine the estimated cardinality. Fig. 2.4 of Bruno demonstrates join selectivity estimation using histograms.

The cited sections of Bruno do not disclose recursively performing steps b) – c) of Claims 1, 23, and 45. As discussed previously, Bruno does not disclose step c) either expressly or inherently, and therefore, it is not possible for Bruno to disclose recursively performing step c). In addition, the cited sections of Bruno do not disclose a selectivity value. As discussed earlier, lines 16-18 of page 11 of the specification of the application recite a selectivity value as the product of two related selectivity values: $SelR(P,Q) = SelR(P|Q) \cdot SelR(Q)$. Therefore, as it has been established that the cited sections of Bruno do not disclose a selectivity value, it is not possible for the cited sections of Bruno to recursively perform steps b) – c) to determine a selectivity value.

Accordingly, Claims 1, 23, and 45 are patentably distinct over Bruno for at least the reasons discussed above. Claims 2-17 and 22 depend from Claim 1, Claims 24-40 and 44 depend from Claim 23, and are patentably distinct over Bruno for at least the same reasons.

The rejection to Claims 46 and 54 asserts that "if the query is not separable, repeatedly decomposing the query selectivity to form a product that comprises a conditional selectivity expression to generate alternative products and wherein one of those products is selected to estimate the selectivity of the query" is disclosed in Bruno at page 9, section 3.2.2, and fig 3.1. The rejection further asserts "Bruno specifically teaches various predicates for example equality join, conjunctive [see fig 3.1b], join predicates, further for a given query, the decomposing query into possible sub queries."

The Applicant respectfully disagrees with the rejection. As discussed earlier with respect to Claims 1, 23, and 45, the cited section of Bruno fails to disclose decomposing the query selectivity to form a product that comprises a conditional selectivity expression. The Examiner is respectfully requested to apply the previous discussion with regard to the rejection to Claims 1, 23, and 45 to the present rejection as conditional selectivity is a concept that is neither disclosed nor contemplated in Bruno.

The rejection further asserts that "recursively performing steps b) – c) to determine a selectivity value for each query selectivity factor" is disclosed at page 5, lines 10-14, section 2.2.2. of page 6, and Fig. 2.4 of Bruno. As discussed previously, the cited sections of Bruno do not disclose recursively performing steps b) – c) of Claims 46 and 54. Also as discussed previously, Bruno does not disclose step c) either expressly or inherently, and therefore, it is not possible for Bruno to disclose recursively performing step c). The Examiner is again respectfully requested to apply the previous discussion with regard to the rejection to Claims 1, 23, and 45 to the present rejection as the cited sections of Bruno do not disclose a selectivity value.

Accordingly, Claims 46 and 54 are patentably distinct over Bruno for at least the reasons discussed above. Claims 47-53 depend from Claim 46, Claims 55-61 depend from Claim 54, and are patentably distinct over Bruno for at least the same reasons.

Rejections under 35 U.S.C. § 103(a)

Claims 19-21 and 41-43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bruno in view of U.S. Patent No. 6,477,534 to Acharya et al. (hereafter Acharya). Claims 19-21 depend from Independent Claim 1, Claims 41-43 depend from Independent Claim 23, and as such are patentably distinct over Bruno in view of Acharya for least the reasons discussed above with regard to the rejection to Claim 1 under 35 U.S.C. § 102(a).

CONCLUSION

Accordingly, in view of the above amendment and remarks it is submitted that the claims are patentably distinct over the prior art and that all the rejections to the claims have been overcome. Reconsideration and reexamination of the above Application is requested. Based on the foregoing, Applicants respectfully requests that the pending claims be allowed, and that a timely Notice of Allowance be issued in this case. If the Examiner believes, after this amendment, that the application is not in condition for allowance, the Examiner is requested to call the Applicant's attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this response, including an extension fee that is not covered by an enclosed check please charge any deficiency to Deposit Account No. 50-0463.

Respectfully submitted,

Microsoft Corporation

Date: July 25, 2006   By: _____

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